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## SEQUENCE LISTING

&lt;110&gt; Takeda Chemical Industries, Ltd.

&lt;120&gt; Betacellulin Mutein

&lt;130&gt; P2001-232

&lt;150&gt; JP 10-350377

&lt;151&gt; 1998-12-09

&lt;150&gt; JP 11-55326

&lt;151&gt; 1999-03-03

&lt;160&gt; 56

&lt;210&gt; 1

&lt;211&gt; 77

&lt;212&gt; PRT

&lt;213&gt; Human

&lt;400&gt; 1

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp			
65					70					75					

&lt;210&gt; 2

&lt;211&gt; 76

&lt;212&gt; PRT

&lt;213&gt; Human

&lt;400&gt; 2

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val				
65					70					75					

&lt;210&gt; 3

&lt;211&gt; 47

&lt;212&gt; PRT

&lt;213&gt; Human

&lt;400&gt; 3

Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys

```

      1           5           10           15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
      20           25           30
Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp
      35           40           45

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<210> 4  
 <211> 46  
 <212> PRT  
 <213> Human

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<400> 4
Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
      1           5           10           15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
      20           25           30
Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val
      35           40           45

```

<210> 5  
 <211> 79  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacellulin mutein (BTC 1-76, 78-80)

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<400> 5
Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
      1           5           10           15
Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys
      20           25           30
Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
      35           40           45
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
      50           55           60
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe Tyr
      65           70           75

```

<210> 6  
 <211> 78  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacellulin mutein (BTC 1-76, 78, 79)

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<400> 6
Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
      1           5           10           15
Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys
      20           25           30
Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
      35           40           45
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
      50           55           60
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe

```

65

70

75

&lt;210&gt; 7

&lt;211&gt; 77

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 1-76, 78)

&lt;400&gt; 7

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55				60					
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu			
65					70					75					

&lt;210&gt; 8

&lt;211&gt; 79

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 1-77, 79, 80)

&lt;400&gt; 8

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55				60					
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Phe	Tyr	
65					70					75					

&lt;210&gt; 9

&lt;211&gt; 78

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 1-77, 80)

&lt;400&gt; 9

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40					45			

Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys  
           50                  55                  60  
 Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe  
 65                  70                  75

<210> 10  
 <211> 49  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacellulin mutein (BTC 31-76, 78-80)

<400> 10  
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
   1                  5                  10                  15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys  
                   20                  25                  30  
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe  
           35                  40                  45  
 Tyr

<210> 11  
 <211> 48  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacellulin mutein (BTC 31-76, 78, 79)

<400> 11  
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
   1                  5                  10                  15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys  
                   20                  25                  30  
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe  
           35                  40                  45

<210> 12  
 <211> 47  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacellulin mutein (BTC 31-76, 78)

<400> 12  
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
   1                  5                  10                  15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys  
                   20                  25                  30  
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu  
           35                  40                  45

<210> 13  
 <211> 49  
 <212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 31-77, 79, 80)

<400> 13

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Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
 1           5           10           15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
      20           25           30
Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe
      35           40           45
Tyr
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<210> 14

<211> 48

<212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 31-77, 79)

<400> 14

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Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
 1           5           10           15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys
      20           25           30
Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe
      35           40           45
```

<210> 15

<211> 231

<212> DNA

<213> Human

<400> 15

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gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga c 231
```

<210> 16

<211> 228

<212> DNA

<213> Human

<400> 16

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gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtt 228
```

<210> 17

<211> 141

<212> DNA

<213> Human

<400> 17  
 cggaaggcc acttctctag gtgcccccaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagttga c 141

<210> 18  
 <211> 138  
 <212> DNA  
 <213> Human

<400> 18  
 cggaaggcc acttctctag gtgcccccaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagtt 138

<210> 19  
 <211> 237  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 5

<400> 19  
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaggcc acttctctag gtgcccccaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtttt gttttac 237

<210> 20  
 <211> 234  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 6

<400> 20  
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaggcc acttctctag gtgcccccaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtttt gttt 234

<210> 21  
 <211> 231  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 7

<400> 21  
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaggcc acttctctag gtgcccccaag 120

caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtttt g 231

<210> 22

<211> 237

<212> DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 8

<400> 22

gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttttac 237

<210> 23

<211> 234

<212> DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 9

<400> 23

gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttt 234

<210> 24

<211> 147

<212> DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 10

<400> 24

cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagtttt gttttac 147

<210> 25

<211> 144

<212> DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID  
 NO: 11

<400> 25

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cggaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaagggtgtg agagagtttt gttt 144

```

```

<210> 26
<211> 141
<212> DNA
<213> Artificial sequence

```

```

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID
NO: 12

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```

<400> 26
cggaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaagggtgtg agagagtttt g 141

```

```

<210> 27
<211> 147
<212> DNA
<213> Artificial sequence

```

```

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID
NO: 13

```

```

<400> 27
cggaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaagggtgtg agagagttga cttttac 147

```

```

<210> 28
<211> 144
<212> DNA
<213> Artificial sequence

```

```

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID
NO: 14

```

```

<400> 28
cggaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaagggtgtg agagagttga cttt 144

```

```

<210> 29
<211> 31
<212> DNA
<213> Artificial Sequence

```

```

<220>
<223> Primer 1

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```

<400> 29
catatggatg ggaattccac cagaagtcct g

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<210> 30  
 <211> 33  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 2

<400> 30  
 ggatccctag tcaactctct cacaccttgc tcc 33

<210> 31  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-1

<400> 31  
 agagtcaagg atcccccaac cact 24

<210> 32  
 <211> 22  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-3

<400> 32  
 agctggtcac ttagggctgg gg 22

<210> 33  
 <211> 26  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-1Cla

<400> 33  
 gaatcgatag agtcaaggat ccccca 26

<210> 34  
 <211> 22  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-3Xho

<400> 34  
 gactcgagct ggctcacttag gg 22

<210> 35  
 <211> 80

<212> PRT  
<213> Human

<400> 35

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35					40					45				
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Leu	Phe	Tyr
65					70					75					80

<210> 36  
<211> 240  
<212> DNA  
<213> Human

<400> 36

gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgccccaaag 120  
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttgttttac 240

<210> 37  
<211> 75  
<213> Human

<400> 37

Gly	Asn	Ser	Thr	Arg	Ser	Pto	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly	Asp
1				5					10					15	
Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys	Gly
		20					25					30			
His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys	Gly
	35					40					45				
Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys	Asp
	50					55					60				
Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val					
65					70				75						

<210> 38  
<211> 53  
<213> Human

<400> 38

Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro
1				5					10					15	
Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val
		20						25					30		
Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala
	35						40					45			
Arg	Cys	Glu	Arg	Val											
	50			53											

<210> 39

<211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 3

<400> 39  
 cagcatatgg ggaattccac cagaagtcct 30

<210> 40  
 <211> 34  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 4

<400> 40  
 ggatccctaa actctctcac accttgctcc aatg 34

<210> 41  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 5

<400> 41  
 cagcatatgg ctaccaccac acaatcaaag 30

<210> 42  
 <211> 225  
 <212> DNA  
 <213> Human

<400> 42  
 ggggaattcca ccagaagtcc tgaaactaat ggcctcctct gtggagaccc tgaggaaaac 60  
 tgtgcagcta ccaccacaca atcaaagcgg aaaggccact tctctagggtg ccccaagcaa 120  
 tacaagcatt actgcatcaa agggagatgc cgcttcgtgg tggccgagca gacgccctcc 180  
 tgtgtctgtg atgaaggcta cattggagca aggtgtgaga gagtt 225

<210> 43  
 <211> 159  
 <212> DNA  
 <213> Human

<400> 43  
 cctaccacca cacaatcaaa ccccaaacc cacttctcta cctcccccaa ccaatacaac 60  
 cattactcca tcaaaccac atcccccttc ctctctcccc accacacccc ctctctcttc 120  
 tctcatcaac cctacattcc accaacctct cacacactt 159

<210> 44  
 <211> 53  
 <212> PRT  
 <213> Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacwelluin mutein (BTC 31-58, Asn, Pro, Ser, 59-80)

&lt;400&gt; 44

```

Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
      5              10              15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Asn Pro Ser Thr
      20              25              30
Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg
      35              40              45
Val Asp Leu Phe Tyr
      50

```

&lt;210&gt; 45

&lt;211&gt; 48

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacwelluin mutein (Asn, Ser, Asp, Ser, Glu, BTC38-80)

&lt;400&gt; 45

```

Asn Ser Asp Ser Glu Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
      5              10              15
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
      20              25              30
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Leu Phe Tyr
      35              40              45

```

&lt;210&gt; 46

&lt;211&gt; 83

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacwelluin mutein (BTC 1-58, Asn, Pro, Ser, 59-80)

&lt;400&gt; 46

```

Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
  1              5              10              15
Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys
      20              25              30
Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
      35              40              45
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Asn Pro Ser Thr Pro Ser
      50              55              60
Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp
      65              70              75              80
Leu Phe Tyr

```

&lt;210&gt; 47

&lt;211&gt; 249

&lt;212&gt; DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID NO: 46

<400> 47

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gatgggaatt ccaccagaag tctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccacaa 120
caatacaagc attactgcat caaaggaggaga tgccgcttcg tgggtggccga gcagaacccc 180
tcgacgcctt cctgtgtctg tgatgaaggc tacattggag caaggtgtga gagagttgac 240
ttgttttac                                     249
```

<210> 48

<211> 159

<212> DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID NO: 44

<400> 48

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cggaaaggcc acttctctag gtgcccacaa caatacaagc attactgcat caaaggaggaga 60
tgccgcttcg tgggtggccga gcagaacccc tcgacgcctt cctgtgtctg tgatgaaggc 120
tacattggag caaggtgtga gagagttgac ttgttttac                                     159
```

<210> 49

<211> 144

<212> DNA

<213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by SEQ ID NO: 45

<400> 49

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aacagcgact ctgagtgtcc caagcaatac aagcattact gcatcaaagg gagatgccgc 60
ttcgtggtgg ccgagcagac gccctcctgt gtctgtgatg aaggctacat tggagcaagg 120
tgtgagagag ttgacttggt ttac                                     144
```

<210> 50

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BT-95h

<400> 50

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agcatatgcg gaaaggccac ttctctaggt
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30

<210> 51

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BT-94h

<400> 51

ctggatccta gtaaaacaag tcaactctct

30

<210> 52

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer PET-1

<400> 52

gaaataattt tgtttaactt taagaaggag

30

<210> 53

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BTC-1

<400> 53

aggagggcgt cgaggggttc tgctcggcca

30

<210> 54

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BTC-2

<400> 54

tggccgagca gaacccctcg acgccctcct

30

<210> 55

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BTC-3

<400> 55

tctatgcgca cccgttctcg gagcactgtc

30

<210> 56

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BTC-7

15/15

<400> 56

tatacatatg aacagcgact ctgagtgcc caagc

35